

CLAIMS

1. A method for inducing tolerance in a patient, comprising:
  - depleting immune cells of the patient;
  - disrupting sex steroid-mediated signaling in the patient; and
  - 5 administering cells from the donor to the patient, wherein the cells are selected from the group consisting of stem cells, progenitor cells, and combinations thereof, wherein tolerance to a donor graft is induced in the patient.
2. A method for inducing tolerance in a patient, comprising:
  - depleting immune cells of the patient;
  - 10 disrupting sex steroid-mediated signaling in the patient, wherein the functionality of the bone marrow of the patient is increased without, prior to, or concurrently with, reactivation of the patient's thymus, and
  - administering cells from the donor to the patient, wherein the cells are selected from the group consisting of stem cells, progenitor cells, and combinations thereof.
  - 15 wherein tolerance is induced in the patient.
3. A method for inducing tolerance in a patient, comprising:
  - depleting immune cells of the patient;
  - disrupting sex steroid-mediated signaling in the patient;
  - 20 administering cells from the donor to the patient, wherein the cells are selected from the group consisting of stem cells, progenitor cells, and combinations thereof; and
  - allowing donor cell engraftment in the patient's bone marrow, wherein the donor cell engraftment is enhanced without, prior to, or concurrently with thymus reactivation,
  - 25 wherein tolerance is induced in the patient.

4. The method of any one of claims 1-3, wherein the thymus of the patient has been at least in part atrophied.
5. The method of claim 4, wherein the patient has a disease that at least in part atrophied the thymus of the patient.
- 5 6. The method of claim 4, wherein the patient has had a treatment of a disease that at least in part atrophied the thymus of the patient.
7. The method of claim 5, wherein the treatment of the disease is immunosuppression, chemotherapy, or radiation treatment.
8. The method of any one of claims 1-3, wherein the stem cells are selected from the 10 group consisting of hematopoietic stem cells, epithelial stem cells, and combinations thereof.
9. The method of any one of claims 1-3, wherein the progenitor cells are selected from the group consisting of lymphoid progenitor cells, myeloid progenitor cells, and combinations thereof.
10. The method of claim 8, wherein the cells are hematopoietic stem cells.
- 15 11. The method of claim 10, wherein the hematopoietic stem cells are CD34<sup>+</sup>.
12. The method of claim 1 or 2, wherein the cells are administered at the time disruption of sex steroid-mediated signaling is begun.
13. The method of any one of claims 1-3, further comprising administering at least one cytokine, at least one growth factor, or a combination of at least one cytokine and at least one 20 growth factor to the patient.
14. The method of claim 13, wherein the cytokine is selected from the group consisting of Interleukin 2 (IL-2), Interleukin 7 (IL-7), Interleukin 15 (IL-15), stem cell factor (SCF), and combinations thereof.
15. The method of claim 13, wherein the growth factor is selected from the group 25 consisting of members of the epithelial growth factor family, members of the fibroblast growth factor family, stem cell factor, granulocyte colony stimulating factor (G-CSF), keratinocyte growth factor (KGF), and combinations thereof.

16. The method of any one of claims 1-3, wherein the sex steroid-mediated signaling is disrupted by castration.

17. The method of claim 16, wherein the sex steroid-mediated signaling is disrupted by surgical castration.

5 18. The method of claim 16, wherein the sex steroid-mediated signaling is disrupted by chemical castration.

19. The method of claim 18, wherein the sex steroid-mediated signaling is disrupted by administration of one or more pharmaceuticals.

20. The method of claim 19, wherein the one or more pharmaceuticals is selected from 10 the group consisting of LHRH agonists, LHRH antagonists, anti-LHRH vaccines, anti-androgens, anti-estrogens, SERMs, SARMs, SPRMs, ERDs, aromatase inhibitors, adrenal gland blockers, aldosterone antagonists, antiprogestogens, progestins, antiprogestins, and combinations thereof.

21. The method of claim 20, the LHRH agonists are selected from the group consisting of 15 eulexin, goserelin, leuprolide, dioxalan derivatives, triptorelin, meterelin, buserelin, histrelin, nafarelin, lutrelin, leuprorelin, deslorelin, cystorelin, decapeptyl, gonadorelin, and acetates, citrates and other salts thereof, and combinations thereof

22. The method of claim 120, wherein the LHRH antagonists are selected from the group 20 consisting of abarelix, cetrorelix, and combinations thereof.

23. The method of claim 20, wherein the anti-androgen is selected from the group consisting of bicalutamide, cyproterone acetate, liarozole, ketoconazole, flutamide, megestrol acetate, dutasteride, finasteride, and combinations thereof.

24. The method of claim 20, wherein the anti-estrogen is selected from the group 25 consisting of anastrozole, fulvestrant, tamoxifen, clomiphene, fulvestrant, diethylstilbestrol, diethylstilbestrol diphosphate, danazol, droloxifene, iodoxyfene, toremifene, raloxofene, and combinations thereof.

25. The method of claim 20, wherein the adrenal gland blocker is selected from the group consisting of aminoglutethimide, formestane, vorazole, exemestane, anastrozole, letrozole, and exemestane.

26. The method of any one of claims 1-3, wherein the tolerance is induced to a donor graft.
27. The method of claim 26, wherein the donor graft is selected from the group consisting of cells, tissues or organs of the donor, or combinations thereof.